

REMARKS

Claims 1-5, 10-16 and 19-21 are pending. Claims 6-9 and 17-18 have been canceled.

Claim 1 has been amended for clarity.

Claim 12 has been amended to recite the subject matter of canceled claim 18.

No new matter has been added by way of the above-amendment.

I. Summary of This Response

Applicants have carefully considered the Examiner's comments in the outstanding Advisory Action. In response to the Examiner's comments, Applicants have: a) amended claim 1 for clarity, b) amended claim 12 to recite the presence of bisphenol compound(s), and c) prepared a Rule 132 Declaration by Mr. Hisashi Mikoshiba (hereinafter "the MIKOSHIBA Declaration").

Applicants now comment on claims 1-5, 10 and 11 in section II. This is followed by Applicants' comments on claims 12-16 and 18-21 in Section III. Lastly, Applicants reiterate the comments made in the April 9, 2007 Amendment in Section IV which should be given due consideration in view of the amendment to claims 1 and 12 and the MIKOSHIBA Declaration.

II. Claims 1-5, 10 and 11

Claims 1-5, 10 and 11 are rejected under 35 U.S.C. 102(e) and 103(a) as being unpatentable over Miura et al., U.S. Patent No. 6,248,512. Applicants respectfully traverse these rejections.

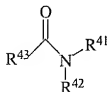
In the outstanding Advisory Action, the Examiner states the following explanation of the April 9, 2007 Amendment:

It is the Examiner's position that the argument with respect to the formula (VI) in reference to Murai et al. is not persuasive since when the group R₄₄, R₄₅, R₄₁, R₄₂ are formed a ring, those group are not limited to the group previously recited such as alkyl, aryl or heterocyclic group, but a heterocyclic ring substituted with any substituent including hydrogen. The claims are not related to the formation of the alkyl, aryl or heterocyclic group to form a ring. The limitation "when R₄₃ represent -N(R₄₄)(R₄₅), then R₄₄ and R₄₅ may taken together to form a ring or at least one of R₄₁ and R₄₂ and at least one of R₄₄ and R₄₅ may taken together to form a ring. The ring are not necessarily formed by the group previously recited.

Applicants have had a difficult time understanding how the Examiner is interpreting claim 1. The Examiner appears to be arguing that there is no limit to the possible groups encompassed by R⁴¹, R⁴², R⁴⁴ and R⁴⁵ when a ring is formed. However, it is Applicants' intention, e.g., for R⁴¹ and R⁴² to each represent an alkyl group, an aryl group or a heterocyclic group even when R⁴¹ and R⁴² are combined to form a ring. And yet, the Examiner is interpreting claim 1 to recite that there is no limit on the possible groups encompassed by R⁴¹ and R⁴² when R⁴¹ and R⁴² are combined to form a ring.

In response, Applicants have amended claim 1 (shown in part below) as follows:

at least one compound having a hydrogen bond formation rate constant K_r that is 20-4000, and which is represented by the following formula (IV):



(IV)

wherein:

and in the formula (IV), R⁴¹ and R⁴² independently represent an alkyl group, an aryl group or a heterocyclic group, R⁴³ represents an

alkyl group, an aryl group, a heterocyclic group or $N-(R^{44})(R^{45})$ where R^{44} and R^{45} independently represent an alkyl group, an aryl group or a heterocyclic group,

wherein R^{41} and R^{42} which independently represent an alkyl group, an aryl group or a heterocyclic group, may be taken together to form a ring, and

when R^{43} represents $N-(R^{44})(R^{45})$, then

R^{44} and R^{45} , each independently representing an alkyl group, an aryl group or a heterocyclic group, may be taken together to form a ring or

at least one of R^{41} and R^{42} , each independently representing an alkyl group, an aryl group or a heterocyclic group, and at least one of R^{44} and R^{45} , each independently representing an alkyl group, an aryl group or a heterocyclic group, may be taken together to form a ring.

Applicants believe that claim 1, as amended above, clearly recites a limit on the possible groups encompassed by R^{41} , R^{42} , R^{44} and R^{45} when a ring is formed. As such, it is Applicants' position that claim 1 is patentable over Miura et al. for reasons set forth in the April 9, 2007 Amendment. These reasons are reiterated below in Section IV for the Examiner's convenience.

III. Claims 12-16 and 18-21

Claims 12-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bojora et al. U.S. Patent No. 3,667,959 and Miura et al. Applicants respectfully traverse the rejection.

In the outstanding Advisory Action, the Examiner states as follows:

The argument with respect to claim 12 is not persuasive. The results presented in the argument such as the suppression of coloration of blank portion during storage in the dark presented in the argument is not persuasive since the results are based on the counsels' assertion. Moreover, the results can not be achieved without the use of bisphenol reducing agents. Applicants are referred to the specification disclosure on page 6, wherein the compound of formula (IV), (III) which is used to achieve the results shown in the argument.

In response, Applicants have: a) enclosed herewith the MIKOSHIBA Declaration so that the technical arguments should be given due consideration; and b) amended claim 12 to recite the bisphenol reducing agents of claim 18.

Applicants now reiterate the arguments made in the April 9, 2007 Amendment which are further supported by the opinion of Mr. Mikoshiba in the attached MIKOSHIBA Declaration.

IV. Applicants Arguments Previously Set Forth In The April 9, 2007 Amendment

IV - A. Miura et al, U.S. Patent No. 6,248,512

Claims 1-5, 10 and 11 are rejected under 35 U.S.C. 102(e) and 103(a) as being unpatentable over Miura et al. Applicants respectfully traverse these rejections.

Applicants have reviewed the Examiner's comments in the October 10, 2006 Office Action and find that the Examiner has maintained this rejection based on a misunderstanding of the scope of the compounds encompassed by Formula (IV) of instant claim 1. It is Applicants' position that Miura et al. fail to teach or fairly suggest the compounds of Formula (IV) of instant claim 1. Furthermore, it is Applicants' position that the compounds of Miura et al. do not satisfy the requirement of instant claim 1 that the compounds have a hydrogen bond formation rate constant K_f of 20-4000.

The Examiner alleges on page 3 of the October 10, 2006 Office Action that compounds A-29 and A-36 of Miura et al. fall within the scope of Formula (IV) of instant claim 1. This is absolutely wrong. Compounds A-29 and A-36 are as follows:

A29



A36



The Examiner will note that Compounds A-29 and A-36 of Miura et al. require that a halogen is bonded to the nitrogen in the amide group.

This is in distinction to instant formula (IV), wherein the groups of R^{41} and R^{42} which bond to the nitrogen are not halogen. When R^{43} is $-N(R^{44})(R^{45})$, R^{44} and R^{45} are not halogen. Thus, the structure of Miura et al. is represented by $-C(=O)-N\text{-halogen}$ whereas the structure of the formula (IV) is represented by $-C(=O)-N\text{-(alkyl, aryl or heterocyclic group)}$. Accordingly, Compounds A-29 and A-36 are not encompassed by the present claims.

Furthermore, Compounds A-29 and A-36 do not satisfy the requirement of instant claim 1 that the compounds have a hydrogen bond formation rate constant K_f of 20-4000. This is explained in further detail below.

The Examiner further alleges on page 3 of the October 10, 2006 Office Action that compounds B-1, B-2, B-3, B-5, B-9 to 12 of Miura et al, also fall within the scope of Claim 1 in the present application. This is also wrong.

In addition, none of compounds B-1, B-2, B-3, B-5, B-9 to 12 nor compounds A-29 and A-36 satisfies the K_f condition of Claim 1.

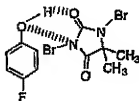
K_f is the hydrogen bond formation rate constant and is used as an index of hydrogen bond formation. It is fully explained in R.W. Taft et al., *J. Am. Chem. Soc.*, 91, 4794-4800 (1969), a copy of which was attached to the April 9, 2007 Amendment for the Examiner's review. This is further explained in the MIKOSHIBA DECLARATION. (See also, the paragraph bridging pages 13 and 14 of the specification of the present application.)

K_f is the equilibrium constant in a reaction where a hydrogen bond is formed between p-FC₆H₄OH and a compound as follows:



The Examiner will note that each of Compounds A-29, A-36, B-1, B-2, B-3, B-5, B-9 to 12 of Miura et al. have an amide group. A hydrogen bond is generally formed between the oxygen atom of the carbonyl group in the amide and the hydrogen atom of the hydroxy group in p-FC₆H₄OH.

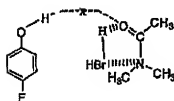
With respect to Compounds A-29 and A-36, both the amide groups are similar in that a bromine atom is bonded directly to the nitrogen atom. For example, the following hydrogen bond is formed between compound A-29 and p-FC₆H₄OH:



The oxygen atom of the carbonyl group has an acceptability of the hydrogen atom which depends on electron density on the oxygen atom. Generally, the lone electron pair on the right nitrogen atom of the above amide group can be shifted toward the oxygen atom by a resonance

effect. Please however note that a bromine atom is bonded to the nitrogen atom in compound A-29. It is well known in the art that a bromine atom withdraws electrons strongly. This results in the lone electron pair on the nitrogen atom in compound A-29 being strongly withdrawn to the bromine atom. The lone electron pair is not shifted toward the oxygen atom of the carbonyl group and therefore the oxygen atom has substantially no acceptability of the hydrogen atom. The case is the same as compound A-36. These facts are easily recognized by a person skilled in the art as stated by Mr. Mikoshiba in the MIKOSHIBA DECLARATION.

With respect to Compounds B-1, B-2, B-3, B-5, B-9 to 12, the Examiner will note that each compound actually has two amide groups along with HBr and Br-Br. For example, Compound B1 would have the following configuration wherein HBr forms hydrogen bond with the amide group as follows:



B-1

A hydrogen bond is formed between the oxygen atom of the carbonyl group and the hydrogen atom of HBr and therefore the oxygen atom has substantially no acceptability of the hydrogen atom of p-FC₆H₄OH. Compounds B-1, B-2, B-3, B-5, B-9 to 12 each has two amide groups in a molecule. One amide group forms a hydrogen bond with HBr and the other amide group forms a hydrogen bond with Br-Br. The oxygen atom of the other amide group also has substantially no acceptability of the hydrogen atom of p-FC₆H₄OH. The case is the same as compounds B-2, B-3, B-5, B-9 to 12. These facts are easily recognized by a person skilled in the art as stated by Mr. Mikoshiba in the MIKOSHIBA DECLARATION.

Thus, compounds A-29, A-36, B-1, B-2, B-3, B-5, B-9 to 12 do not satisfy the Kf condition of Claim 1.

Since Miura et al. only disclose compounds (even generically) having the nitrogen bonded to a halogen atom, Miura et al. do not anticipate nor render obvious the claimed invention. Thus, the claimed invention is patentable over Miura et al. and withdrawal of the rejection is respectfully requested.

IV - B. Bojora et al. U.S. Patent No. 3,667,959 and Miura et al.

Claims 12-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bojora et al. U.S. Patent No. 3,667,959 and Miura et al. Applicants respectfully traverse the rejection.

First, Bojora et al. and Miura et al. are silent of polyhalogenated compounds. No one skilled in the art would have been motivated to use the polyhalogenated compounds in a photothermographic material and would have predicted the advantageous effects caused by utilizing the polyhalogenated compounds before the claimed invention was made as stated by Mr. Mikoshiba in the MIKOSHIBA DECLARATION.

The Examiner states in Item 5 of the October 10, 2006 Office Action that Bojora et al. disclose a photosensitive and thermosensitive element containing sulfonyl group including that claimed in the present claimed invention in a photothermographic material such as the preferred compound in column 3, lines 10, 30 and 65. Please note that Bojora et al. use the sulfonyl-containing compounds as an organic solvent. See Claim 1 and column 2, lines 42-53. The sulfonyl-containing compounds that can be used in Bojora et al. are compounds useful as an organic solvent. Accordingly, a person skilled in the art would only have been motivated to use the sulfonyl-containing compounds as an organic solvent as stated by Mr. Mikoshiba in the MIKOSHIBA DECLARATION.

The object of the invention described in Bojora et al. is to provide improved maximum image densities and reduced exposure and processing time, i.e. acceleration of development. This is in distinction to the object of the claimed invention which is to provide a

photothermographic material that can sufficiently suppress coloration of blank portions during storage in the dark after development (see page 1, lines 3-5 of the specification). Bojora et al. are silent on the suppression of coloration of blank portions during storage. The object of the claimed invention is achieved by using the sulfonyl-containing compound of formula (III) in combination with the phenol compound in a photothermographic material. No one skilled in the art reading Bojora et al. would have been motivated to use the sulfonyl-containing compound in order to improve the coloration of blank portions during storage. Also, no one skilled in the art would have predicted that use of the sulfonyl-containing compound improves the coloration of blank portions during storage before the claimed invention was made as stated by Mr. Mikoshiba in the MIKOSHIBA DECLARATION.

In Example 1 of Bojora et al., tetrahydrothiophene-1,1-dioxide is used as a sulfonyl-containing organic solvent. The amount is rather small. As is well known in the art, tetrahydrothiophene-1,1-dioxide is easy to volatilize. As such, most of the added dioxide will volatilize off during a heat development and therefore little dioxide will remain in the photothermographic material after the heat development. Therefore, the photothermographic material of Bojora et al. cannot suppress coloration of blank portions during storage in the dark as stated by Mr. Mikoshiba in the MIKOSHIBA DECLARATION. This is in distinction to the claimed invention, wherein the sulfonyl-containing compound of formula (III) remains and functions well in the photothermographic material after the heat development.

Also, Miura et al. are silent of the use of sulfonyl-containing compounds to improve the coloration of blank portions during storage. As such, Miura et al. do not compensate for the deficiencies of Bojora et al.

In view of the deficiencies in Bojora et al. and Miura et al., the claimed invention is thus patentable over Bojora et al. and Miura et al. and withdrawal of the rejection is respectfully requested.


In view of the above amendment, applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D., Esq. (Reg. No. 43,575) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to our Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under § 1.17; particularly, extension of time fees.

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Respectfully submitted,

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Attachment: The MIKOSHIBA Declaration